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in person, I asked one of the senior resident members of the Cooper Club, a man justly renowned both as an observer and student of California bird-life, to report on conditions there during the past two years. His reply just to hand, is frank and illuminating: "I know no more of the Phalacrocoraxes on Seal Rocks, off the Golden Gate Park here, than a cat does of catachresis, more's a pity! I do not get out to the ocean shore once in two years * * * At Pigeon Point, Point Lobos, and the rocky islands around Monterey Bay they breed in numbers, as you most probably are aware, but when it comes to *Seal Rocks* right under my nose, as it were—you have me guessing."

Now if I had any thought that this veteran brother would take offense (he is rather fond of "ragging" the rest of us, by the way) I should not publish this inquiry. But knowing him for a game sport, I shall not scruple to point my moral. I am honestly desirous of learning something definite about this wonderful living "habitat group" of breeding Cormorants (to be reproduced in effigy by the California Academy of Sciences at great expense, and installed at only a few furlongs remove from this real example). Doubtless if I had the addresses of some few of the tens of thousands of tourists who have gazed in wonder and admiration at this ebony pageant exhibited upon your very doorstep, visitors who, as you boast, come flocking from every clime of the habitable globe, I should learn what I need to know about your Shags. But I appeal to you, dwellers by Niagara, twenty of you (fifty-seven in the Bay Cities), if the Cooper Club lists are correct, your very faces wet daily by the spray struck off from the surf dashing on the Seal Rocks, what do you know about these birds? This is the year you have invited us to share your hospitality, to view your charms, to taste your fare, to pass judgment upon your vaunted achievements, to decide, it may be, whether we will abide with you. We are coming, ourselves a human Niagara, ten thousand thousand strong. In particular, we of the Cooper Club and American Ornithologists' Union are coming half a thousand strong. Are you prepared to receive us? Are you ready to guide us? If we grant you absolution for voluntary ignorance of the presumed banalities of the always "famous" Seal Rocks, will you show us instead the feathered treasures of Stow Lake, and Muir Woods, and Mt. Tamalpais, and Mill Valley, and San Bruno, and Wild Cat Canyon? Or will you leave us to suppose (very incorrectly) that the immediate setting of the Bay Cities is destitute of avian attractions? "The Farallon Islands", yes! and "Lake Tahoe", by all means! But let us also view you *at home*. We are coming to see San Francisco's Niagara.

Santa Barbara, California, December 10, 1914.

BIRDS OBSERVED ON FORRESTER ISLAND, ALASKA,
DURING THE SUMMER OF 1913*

By HAROLD HEATH

WITH EIGHT PHOTOGRAPHS AND ONE DRAWING BY THE AUTHOR

(Contribution from the Department of Zoology, Stanford University, California)

IN THE latter part of April, 1913, the writer was appointed to conduct a biological survey of the Forrester group of islands, Alaska, under the joint auspices of the United States Fish Commission and the National Associa-

*Printed by permission of Doctor Hugh M. Smith, United States Commissioner of Fisheries.

tion of Audubon Societies. The field-work extended from May 16 until August 9 of the same year. Geographically this archipelago lies thirteen miles to the southeast of Dall Island, the waters surging through Dixon Entrance rush past its shores, and the southeastern Alaskan boundary line barely clears the rocky islets fringing its southernmost extremity. The main island measures



Fig. 10. CLIFFS ALONG THE NORTHWESTERN FACE OF FORRESTER ISLAND, SOUTHEASTERN ALASKA

approximately four and one-half miles in length by one in greatest width, and to the north and south is separated by comparatively narrow, tide-swept channels from several other islands. Two of the latter, Lawrie and South, are fully one-third of a mile in greatest diameter, and support a fairly heavy and varied growth of trees and shrubs.

In cross-section the main body of Forrester Island presents the appearance of a triangle the apex of which coincides with a prominent ridge extending in a general north-and-south direction. Five distinct peaks appear in this backbone, forming a graded series of approximately eight hundred feet height on the north, to thirteen hundred and ninety-five feet in the case of the southernmost which is placed somewhat to the south of the center of the island. To the westward the land falls away toward the sea at a more abrupt angle than on the east—probably as twenty is to fifteen degrees—but in the vicinity of the sea the descent is far more rapid. On the northwest face of the island, for example, the cliffs rise from the sea to a height of three to four hundred feet at angles varying from fifty to eighty degrees. This same state of affairs continues along the entire west coast, though in a general way the height varies directly as the distance from the southern extremity. In other words, as one traverses the coast from north to south the cliffs will be found to retain their precipitous character, although their elevation becomes less and less. Along the eastern border of the island the cliffs are comparatively low with the exception of those in the neighborhood of the highest peak, where they attain a height of two or three hundred feet.

As noted previously several islands lie to the north of Forrester Island, but almost without exception they are comparatively barren surf-beaten rock masses without safe harbors or landing places except in the calmest weather. Lawrie Island, on the other hand, has a much greater area, measuring approximately one third of a mile in greatest length, and is fairly flat and moderately wooded. In the intervening glades grass and wild flowers grow in rank profusion, a small spring supplies water of fair quality, and were it not for the fact that there is no adequate harbor the place would make an ideal camp site. In ancient times members of the Haidah tribe made it their headquarters during the summer months, and even yet resort to its shores for their wood supply, although the shores are boulder strewn and highly unsafe in stormy weather.

Of the three islands to the south of Forrester, the middle one, here provisionally named South Island, was the only one examined critically, since it is much the most important, and the weather was suitable for landing on a very few days only. While its area is somewhat less than that of Lawrie it is far more rugged, with two main hills, perhaps one hundred and twenty-five feet in height, separated by a central ravine a few feet above tide level. Along the southern face these hills fall away abruptly to the sea, and on the cliffs thus formed, innumerable sea birds find a home.

VEGETATION.—The vegetation of Forrester Island is extensive and varied. Fully nine-tenths of its surface is covered with a moderately heavy growth of Sitka spruce (*Picea sitchensis*) and hemlock (*Tsuga heterophylla*), with the intermediate spaces overgrown with dense thickets of salmonberry (*Rubus spectabilis*), three species of huckleberry (*Vaccinium*), and elderberry (*Sambucus callicarpa*), together with devil's-club (*Echinopanax horridus*) in painful profusion. Skunk cabbages (*Lysichiton camtschatcense*) grew in some of the marshy districts to an enormous size, many of the leaves reaching a length of over five feet; while moss and lichens, of several different species, were omnipresent, and formed a beautiful though watersoaked carpet variegated with flowers of many tints. All of these features together with precipitous rocky outcrops, windfalls without end, and the absence of trails, render travel slow and difficult.

In sharp contrast to this jungle is a relatively large open meadow, about the center of the island, overgrown with heather and set with several exquisite pools in which the yellow water lily (*Ammoenia peploides major*) abounds and the eagles find bathing places. It is worthy of note that several of the Haidah Indians report that fifty or sixty years ago the entire island was much more open than now. Salmonberry and huckleberry thickets were unknown and grassy slopes predominated. Still earlier, according to tradition, the groves of spruce were likewise more open, and apparently the entire place was more like Lawrie Island is at the present time. As will appear later on in the account, this may explain the absence of the Rhinoceros Auklet and the Ancient Murrelet from places where they were formerly abundant.

It is also worthy of note that the dwarf juniper (*Juniperus communis*), together with greatly stunted lodgepole pines (*Pinus contorta*), are fairly abundant in the lake region. This same locality is also the home of the west-

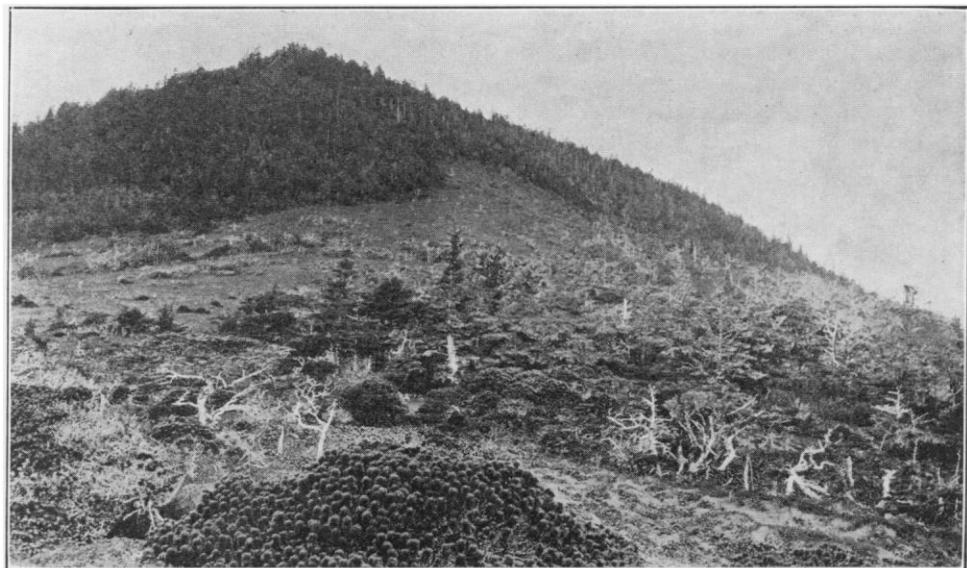


Fig. 11. LOOKING SOUTH FROM THE LAKE REGION; LODGEPOLE PINE GROVE IN THE FOREGROUND

ern red cedar (*Thuja plicata*), though the trees are all small as though recently introduced.

I am greatly indebted to my son Ronald, whose keen sight and agility resulted in many observations which have added much to the value of this report. To Mr. W. D. McLeod, acting as interpreter, naturalist, guide and genial companion, I am also under deep obligation. Captain John, an unusually keen and accurate naturalist of the Haidah tribe, was also of the greatest assistance. Mr. John Beatty, Thaddaeus Isaac, George Haldane and Edwin Scott were also valuable helpers during the course of the survey.

LAND BIRDS.—Naturalist fishermen and others with accurate powers of observation and extended knowledge of the country declare that the land birds are more numerous on Forrester Island than at any other point in southeastern Alaska. This may be accounted for, in part at least, by the report that the

path of migration follows the coast, and Forrester accordingly serves as a way station. It is certainly true that there are few natural enemies on the island and an abundant food supply which factors render the reservation well-nigh ideal. Furthermore, the immediate region, especially to the east of Dall Island, is the feeding ground of a large number of migrant water birds, so that accurate observation during a few seasons would doubtless add materially to our knowledge of many matters connected with the time of migration, the route pursued and nature of food supply. The following species of land birds were positively identified during our visit. Where any doubt existed specimens were secured and later determined at the California Museum of Vertebrate Zoology.

1. *Haliaeetus leucocephalus alascanus*. Northern Bald Eagle. This northern representative of the national bird numbers at least one hundred and fifty individuals on Forrester Island. Almost every headland has its aerie, and several nests were also found on the islets to the north and south, while the young, from one to four years old, inhabit the same or intermediate regions. Generally speaking their reputations, like those of their congeners to the southward, are distinctly bad. In pleasant weather when the sea is fairly calm they may be seen to soar out from some elevated perch, and the return trip is usually made with a herring in their talons; but when the summer season opens the bill of fare very frequently includes birds, both young and old. Remains of Cassin Auklets, Ancient Murrelets and Rhinoceros Auklets are frequently encountered on the hillsides, especially in the vicinity of eagle's nests, and this fact together with the reports of the natives fixes the blame on the king of birds. Young gulls and murres are also readily and frequently captured; and on the larger islands to the north and east numbers of fawns are struck down, so that between the eagles and the wolves the deer are fast disappearing. In the neighborhood of the salmon canneries they act as scavengers, and astonishingly large numbers congregate in such situations. In the neighborhood of Waterfall, near the north end of Dall Island, fifty-seven eagles were seen along the coast within a distance of less than one third of a mile, and it is reported that they are far more abundant in several other localities.

Almost all of the nests were placed in inaccessible positions, invariably in large spruce trees, but from elevated headlands it was possible to see that they contained eggs from the middle to the last of May. Newly hatched young were found on the 11th of June, and one scarcely able to fly appeared near the camp on the 8th of July. During this time the parents are active and extremely bold in the capture of prey, and the cries of pursuing gulls could be heard about the cliffs at distressingly frequent intervals. Their work of destruction in the fall is generally transferred to the larger islands or to the mainland, and it is claimed that when the food supply fails along the beaches, or birds and small mammals are too wary, a pair will hunt out a small deer in the open meadows, and after tearing out its eyes will buffet it with their wings until dazed and wearied it finally succumbs.

The eagles gather daily about the lakes on Forrester Island, and two partially submerged spruce logs are worn smooth where they have stood during the bathing process. During rare intervals when the rain has ceased to a sufficient extent to allow some of the smaller pools to drain, the bottom ooze is tracked in various directions and is occasionally fashioned into distinct wallows. These phenomena are familiar to the Indians, who claim that these birds

are very fond of "lake worms", evidently meaning the larvae of the caddisfly, and just as a chicken dusts its feathers to rid itself of vermin, the eagle will wallow in the mud when the need is pressing.

2. ***Falco peregrinus anatum*.** Duck Hawk. The duck hawk on Forrester Island deserves to be called the king of birds. It reigns supreme, and neither the eagle nor the raven nor any other native bird can stand against its onslaughts. At least none do so during the nesting season. They are, however,

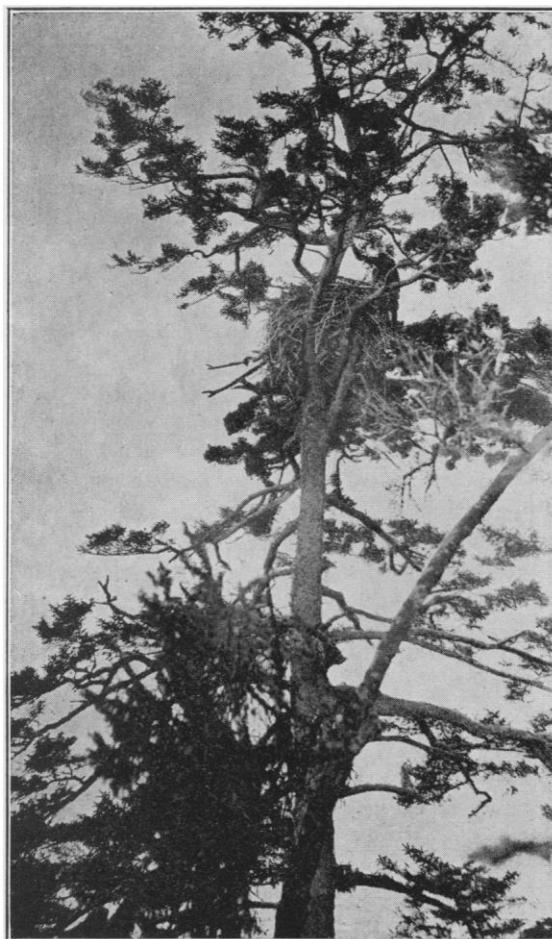


Fig 12. NEST OF BALD EAGLE ON FORRESTER ISLAND,
ALASKA

not a source of great disturbance as only four nests were located during the season of 1913. These with one exception were placed on inaccessible cliffs. The exception was likewise on the face of a high cliff, but was easy of approach from above, and when discovered on June 11th contained three young, downy white with a few definitive, brown feathers. What the original nest material (if any existed) was it is impossible to say as the surroundings within a radius of two feet were covered with the feathers of Ancient Murrelets,

and debris of varied description. Other murrelet remains were plentiful at many points in the nearby forest, and it is evident that this species is a powerful agent of destruction among the birds of this kind.

For a considerable time it was a puzzle to know how a bird of diurnal habits could capture one that flies by night. For example, how does the duck hawk or the eagle strike down the Ancient Murrelet or the Rhinoceros or Cassin Auklet? Once more the Indians are responsible for the statement that the first and last named species are captured only when they have been injured by striking against trees, and are caught in the early morning before they have recovered. This may sound somewhat mythical, but several of these birds were actually captured which had struck against unlighted tents, and it is by no means uncommon to hear them strike the boughs of trees during the night, and to find them fluttering about in the underbrush. There are good reasons for accepting the statement of several old men of the Haidah tribe that trees were relatively scarce on Forrester Island a hundred or more years ago. The night birds then flew without let or hindrance, but in recent times, when conditions have changed, they have not adjusted themselves to meet these conditions.

As to the Rhinoceros Auklets, they leave their homes in the early morning, usually at the break of day, but if the sky be thickly overcast or a heavy fog prevails the day's journey may be delayed for several hours, according to the Indians who used to capture them for food. If a man can take them under such circumstances it is evidently no difficult task for their older enemies to perform the same feat.

3. **Cryptoglaux acadica.** Sawwhet Owl. Although the natives report that they have never seen an owl of any description on Forrester Island, a Sawwhet was secured within a few feet of our tent on the evening of August 9.

4. **Selasphorus rufus.** Rufous Hummingbird. Throughout the summer this bird was in evidence in many parts of Forrester and the neighboring islands. One in particular, stationed near the camp, was under observation, but there were no evidences that it or the others nested.

5. **Empidonax difficilis difficilis.** Western Flycatcher. This bird undoubtedly breeds on Forrester Island as one family of fledglings, scarcely able to fly, was seen on one occasion. The adults are rather rare in most localities on the main island, though at least a dozen were seen in the neighborhood of the open glades on Lawrie Island, about half a mile to the north of Forrester.

6. **Corvus corax principalis.** Northern Raven. The men of the Haidah tribe who have visited Forrester Island summer and winter for many years are responsible for the statement that only a single pair of ravens remains there throughout the winter. If this is indeed an assured fact it is certain that they are joined by a very considerable company in the spring. By the middle of May there were certainly not less than two hundred individuals, possibly more, but as they forage widely it is difficult to make a just estimate of their numbers. As it was past the egg-laying season at the time of our arrival no serious attempt was made to discover their nests, and it is somewhat doubtful if they could have been found without the consumption of much time and patience, for these birds are as keen sighted as eagles and as sly as foxes. Several times they were seen carrying food to their young, but in every case they eluded pursuit, and the juveniles were not noted until late in July when

they were seen travelling about the beaches in company with one or both of the parents.

Although a sleep destroyer in the early morning the raven cannot be said to be a serious enemy of the birds. Generally speaking its food supply is found along the shore line, and it is not certainly known that they robbed a nest or killed a bird at any time during the summer.

7. **Corvus caurinus.** Northwestern Crow. Black in color and with a reputation of the same hue, the fish crow is an unmitigated nuisance. Scores of these birds find a nesting place on Forrester Island, and the worry they occasion among the cormorants, gulls and pigeon guillemots is almost as extended as their waking hours. Frequently they may be seen sneaking stealthily over the cliffs, occasionally picking up refuse material thrown up by the sea or picking at barnacles and mussels, but nearly as often they are on the lookout for eggs. In some cases these are punctured merely in a spirit of mischief as no attempt is made to devour the contents, but at other times the eggs and young are packed off and eaten at leisure. The Pigeon Guillemots are the chief sufferers apparently, as several nests under observation were robbed systematically and at the close of the season only one young bird was found.

8. **Loxia curvirostra minor.** American Crossbill. Several flocks of crossbills appeared on Forester Island about June 21, and remained throughout the summer, at least until the close of our stay on August 9. During that time they almost invariably remained among the cones at the tops of the tallest spruces, feeding with feverish activity to the accompaniment of a chorus of notes which strongly resembled a wireless telegraph instrument operating at a considerable distance. It is improbable that they nest on Forrester, though they certainly do so on Prince of Wales Island, as one young individual, scarcely able to fly, boarded a launch in the neighborhood of Hetta about the middle of June. They are also reported to breed on Dall Island.

9. **Passerulus sandwichensis sandwichensis.** Aleutian Savannah Sparrow. One specimen secured May 25, the only individual of the species seen.

10. **Junco oreganus oreganus.** Oregon Junco. Several juncos were seen at various times throughout the summer in the hills bordering the lake region in the central part of the island. A single nest, containing recently hatched young, was found on June 3 in the side of a small mound covered with moss and heather.

11. **Melospiza melodia rufina.** Rusty Song Sparrow. Song sparrows were usually in evidence among the salmon berry thickets along the north shore of Forrester Island, in several parts of Lawrie Island, and were relatively abundant on South Island. One female, in the first named locality, was seen carrying insects into the shrubbery, but the nest was never found.

12. **Passerella iliaca townsendi.** Townsend Fox Sparrow. This species of sparrow was the most abundant land bird in the region, being found from one end of Forrester Island to the other as well as on Lawrie and South islands. It was especially numerous in the vicinity of the camp where it fed at the boxes several of the fishermen provided for their feathered friends. Nests were also plentiful, principally in the roots of stumps and in crevices of the rocky cliffs. Judging from three pairs close to the tent, two broods are raised each year.

13. **Vermivora celata lutescens.** Lutescent Warbler. On several different days throughout the spring and summer Lutescent Warblers were seen feeding in the thickets of salmon berry at various points on the island. During the early part of the season especially these were watched for a considerable time for indications of nest building or the presence of young birds, but the signs were never conclusive, though it is altogether possible that they actually do breed in the Forrester Island group.

14. **Wilsonia pusilla pileolata.** Pileolated Warbler. On various occasions one or two Pileolated Warblers were seen in the dense thickets along the shore across the island from the camp, though there were no indications that they bred in the locality.

15. **Nannus hiemalis pacificus.** Western Winter Wren. These diminutive birds were almost as numerous as the Townsend Fox Sparrow, and were as widely distributed. No less than twenty nests were found throughout the spring and early summer located, in every instance, in cavities among the roots of upturned trees.

16. **Certhia familiaris occidentalis.** Tawny Creeper. These birds are comparatively rare on Forrester Island, as a few individuals only were seen during the summer. Among these were two immature birds that were doubtless hatched on the island though no nests were discovered.

17. **Sitta canadensis.** Red-breasted Nuthatch. A single individual of this species was seen on the side of a spruce stub in the latter part of May.

18. **Penthestes rufescens rufescens.** Chestnut-sided Chickadee. Small flocks of these birds were met with in various parts of the island from the first of June until August. There were no indications of pairing, however, or young birds or any proof that they nest on the island.

19. **Regulus satrapa olivaceus.** Western Golden-crowned Kinglet. This species is common throughout the main island. There are indications that it nests during the latter part of May and early June.

20. **Hylocichla ustulata ustulata.** Russet-backed Thrush. Thrushes were common, especially about the camp where several nests were found during the month of June.

21. **Planesticus migratorius caurinus.** Northwestern Robin. A few individuals were seen during the summer, but there was no evidence to show that they nested.

22. **Ixoreus naevius naevius.** Varied Thrush. Common throughout the main island. Several nests were found in June.

SEA BIRDS.—Forrester Island is fully as secure a haven for the dozen or so species of water birds, which dwell upon its shores, as for the land birds. Certain species are the prey of the duck hawk and the eagle, the fish crow carries off the eggs and young of those whose nests are exposed upon the cliffs, but the destruction is not especially serious, and on the other hand the food supply is abundant. Furthermore the wolf and fox, which on neighboring islands are responsible for the destruction of many species of birds, both land and marine, are absent on Forrester, and in many respects the habitat is indeed most satisfactory.

Only the birds that are actually known to nest on the island are described in the following list. The natives report a species of "duck" (their name for

almost every kind of water bird) which nests on South Island—a name I have given provisionally to the largest of the three islands bordering Forrester on the south. From their description it might be the Least Auklet, since it is reported to nest beneath masses of boulders on the beach, lays one white egg, and has the characteristic cry. Owing to continued stormy weather it was not possible to effect a landing until late in June, at which time no traces of these birds could be detected.

A pair of Harlequin Ducks was seen on several occasions in a little cove half a mile south of the camp. From their behavior it is fairly certain that they nested in the vicinity, though long continued search failed to disclose the whereabouts of the nest. White-winged Scoters, swimming in pairs near shore, were seen at various times, but there is no evidence that they nest on the island. Last year a pair of Old-squaw Ducks were reported to have nested on the shores of one of the highland lakes. No trace of the species was noted this past season.

The following species are normally found on the island, and nest there regularly.

1. **Lunda cirrhata.** Tufted Puffin. This species is probably the most abundantly represented sea bird on Forrester Island. When resting on the water each individual has a sphere of influence, so to speak, being separated from its fellows by a distance of several feet. With a field glass this open rank formation can be followed for miles along the coast, and for hundreds of yards out to sea. It is impossible to count such an innumerable company, and guesses on the part of the fishermen ranged from ten thousand to two million. By carefully spacing off equal sized areas on a map and estimating the number of birds in a given district it was possible to arrive at a very general estimate of the total population. Such a method has its disadvantages, but it is safe to say that at least 70,000 of these birds were on Forrester Island during the past season.

For fearlessness, pluck and dash the Tufted Puffins have no equal on the island, and the maledictions and gaff hooks hurled at them during the fishing season were probably as numerous as the birds themselves. While their natural food consists almost wholly of sand launces, they are by no means averse to cleaning the bait from the fishermen's hooks. For hours at a time they will follow a rowboat, and rarely indeed is a fisherman able to sink a line below their diving depth, or slip it into the water without detection. Fortunately not all of the puffins are engaged in this thrifty method of gathering food, and the boatman is usually able to cross some other fisherman's path and switch the pest on to his trail.

On one occasion a puffin was stunned by an accurately aimed gaffhook and was hauled aboard. Upon recovering consciousness it was held by the feet and fed herring until the exasperated boatman terminated its career by wringing its neck. This is perhaps an extreme case, but it serves to illustrate the boldness of the species and to furnish a reason for the steady increase in numbers which the natives have observed during the past twenty years.

Eggs were in the burrows the third week in June; young appeared by the middle of July, possibly earlier.

2. **Fratercula corniculata.** Horned Puffin. The Horned Puffin for some unknown reason is comparatively rare on Forrester Island. Conditions appear to be as favorable for its existence as for the Tufted Puffin, and yet it is prob-

able that not over two or three thousand made their homes on the island during the past season. In the afternoon especially they are wont to sit at the entrance of their burrows, and rowboat journeys and fairly accurate counts were made on several occasions. In most instances they form small colonies in the face of a cliff some distance from human habitation, and at all times appear to be at peace with their more numerous relatives.

Their food, nesting and other habits are essentially the same as those of the Tufted Puffin.

3. **Cerorhinca monocerata.** Rhinoceros Auklet. For many decades it

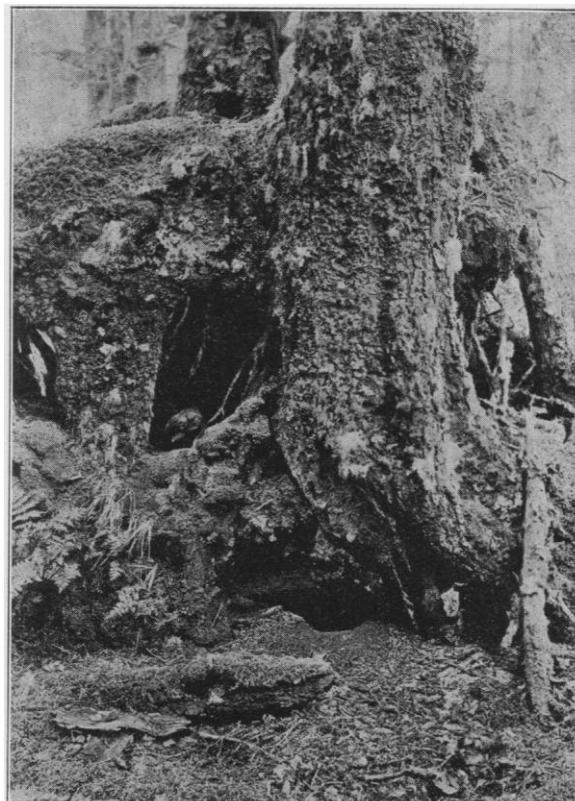


Fig. 13. ENTRANCE TO BURROW OF RHINOCEROS
AUKLET AT BASE OF SPRUCE

has been the custom of the Haidahs living on the southern half of Prince of Wales Island to abandon their homes in the springtime, and establish temporary camps on Dall Island. Here they fished, hunted or cruised in dugouts in search of sea otter until the Rhinoceros Auklet put in an appearance, usually in the latter part of April. By this sign they knew that on Forrester Island the nesting season was at hand not only for the auklet, but for the gulls and later the murres and cormorants, and accordingly they repaired to this summer resort for their annual egg and bird collecting holiday.

Generally speaking the Rhinoceros Auklet occupies burrows in the slop-

ing sides of the island from the shore line to a height of from 400 to 500 feet, their number and distribution depending upon the nature of the soil and the character of the surrounding vegetation. The most favorable nesting sites appear to be the dense spruce woods where the shadows are of such depth that ferns and underbrush find but scanty foothold, and the soil is soft and friable. In such localities over four hundred burrows have been counted in an area six hundred feet square, but where the salmon- and elder-berry are abundant, and ferns form a tangled mat, or rock outcrops are plentiful and the soil thin the nests are of less frequent occurrence or are absent altogether. While no

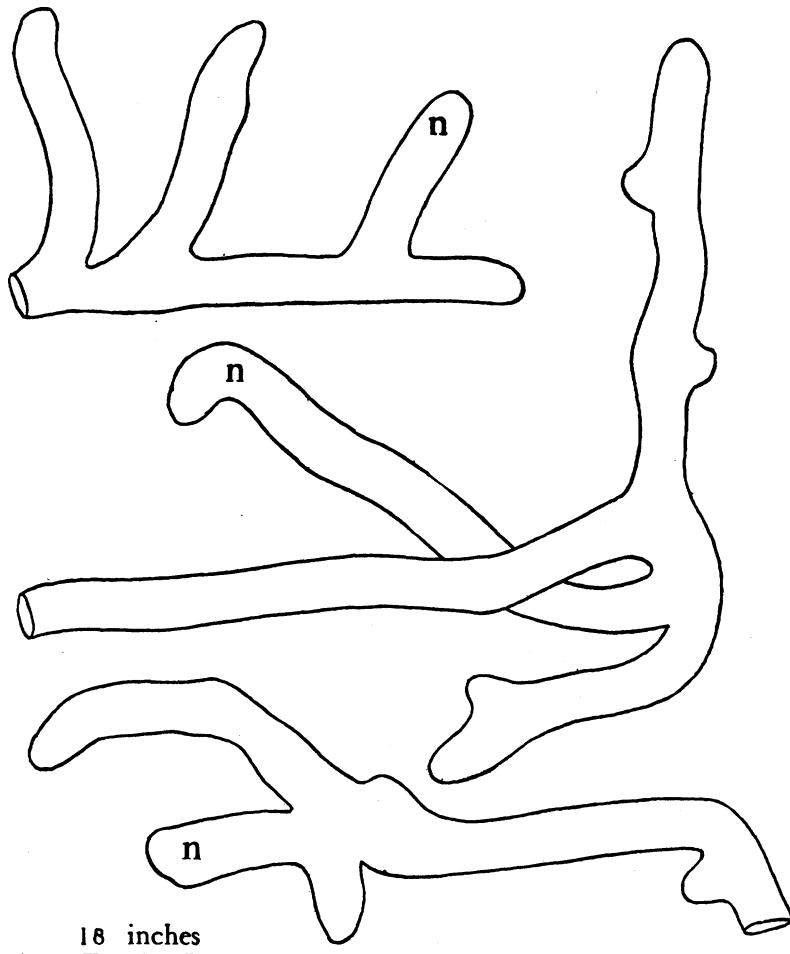


Fig. 14. DIAGRAMS OF RHINOCEROS AUKLET BURROWS

complete and accurate count is possible it is safe to say that not less than fifteen thousand pairs of these birds found a home on Forrester Island during the past season.

Judging from this year's observations the breeding season commences in the latter half of May. At this time the old burrows, which have caved in during the winter or have become clogged with debris brought in by mice, are given a thoroughgoing cleaning, and the accumulation of spruce needles and cones, decayed grass, moss, leaves, stems and earth scraped to the front of the

entrance forms a conspicuous mound in many instances. In some cases the tunnels have already been cleared to some extent by the Cassin Auklet and to a less degree by the Ancient Murrelet, but the relations of these birds appear to be undisturbed even when two species occupy the same home.

As a general thing the opening of the nest is about the base of stumps or trees or under logs, and only rarely does it occupy open ground away from the forest. As to the burrow, it is a highly variable structure, neglecting the fact that it is at least eight feet in length. In extreme instances it attains a length of fully twenty feet, and as indicated in the accompanying diagrams its configuration is subject to many variations. There is usually one main channel, rarely with two outlets, and from this there are one or more blind offshoots. In one of these the nest is frequently placed, but it is by no means a usual occurrence to find it close to the entrance as some of the Haidah men declare to be the case.

The composition of the nest depends upon the material at hand. Where spruce trees abound the building materials are largely small twigs; where salmonberry, moss and ferns are in the vicinity these are utilized, and in either case are fashioned into a shallow, saucer-shaped nest. The single egg, white with obscure lavender spots, is laid in June from the 1st to the 15th. Newly hatched young were found as early as the 27th, but the greater number hatch out during the first week in July. The period of incubation lasts about three weeks as far as can be determined from the data at hand, though it must certainly be somewhat more extended when the burrow is poorly drained, and the nest a soggy mass. On August 6 several burrows were opened and found to be empty, and about the same time the fishermen reported having seen young birds, accompanied by one or both parents, some distance out at sea.

The duty of incubation rests upon both parents, as individuals of either sex have been found in the burrows during the day. During this time the mate is fishing at sea, and returns shortly before dark, or more accurately about 10 P. M. The day shift now puts to sea to return in the early morning hours.

The natives are unanimous in declaring that they now know of no other nesting site of the Rhinoceros Auklet in southeastern Alaska. This being the case it is evident that they frequently fly considerable distances in search of food. On rare occasions they were reported by fishermen operating upwards of a mile from shore, but in the great majority of cases they sought more open water at some distance from land, such as the channel between Forrester and Dall Islands. A marked exception to this rule may be witnessed throughout the summer on the eastern side of Dall Island in Kaigani and Tlivak straits. Here the tide sets strongly, especially in the region of the narrows of Skookum Chuck at the north end of Dall Island, and with an abundance of floating organisms serving as fish food the conditions are most favorable not only for auklets but for several other water birds such as gulls, ancient and marbled murrelets, pigeon guillemots and cormorants. In order to reach this locality the Rhinoceros Auklet makes a round trip journey of at least sixty miles if it flies directly over Dall Island. This, however, is doubtful as flocks have been seen at nightfall coming down the straits on the east side of Dall, and, after rounding the southern end, their course is doubtless a bee line for home. Under such circumstances it requires a completed journey of fully one hundred and twenty miles to bring them to the feeding grounds and back again. Whatever

their route it is certain that they are most rapid flyers, and in the dim evening and morning light it is a difficult feat to follow their bullet-like flight against the sky. If the day be foggy or dark the usual early morning departure may be delayed for an hour or so. Under such circumstances they rest in front of their burrows, or wander about the neighborhood, uttering their curious nasal cry of four short notes rapidly repeated.

In former times the Rhinoceros Auklet was far more numerous than it is at the present time, according to the reports of the Indians. As late as fifty years ago many of the slopes now untenanted afforded nesting sites for these and other birds, and the hills now occupied had a far greater population than one finds today. In those earlier times the sky was literally darkened as they put out to sea, and the sound of their cries was a veritable babel. The diminution might naturally be ascribed to the activity of the natives, who relish this species above all others, but the natives themselves meet such a claim with the evidence of many scores of years when, with a much larger tribe than at



Fig. 15. EGG AND NEST OF RHINOCEROS AUKLET WITH SIDE OF BURROW CUT AWAY

present, they gathered eggs and birds in vastly greater numbers without any appreciable decline in the bird colony. Their explanation rests solely upon the belief that the decrease is due entirely to the rank growth of underbrush and ferns which form a tangled mat too dense to permit of ready flight to and from the burrows. In former times, even within the memory of some of the older men of the tribe, the country was much more open; and it is certainly a readily observed fact that this species avoids the thickets and seeks out more open ground. Occasional nests are found in salmon berry patches, but well worn runways invariably lead into the open.

The food of the Rhinoceros Auklet, whether young or old, consists wholly of sand launces, according to the reports of the natives, and an examination of a few stomachs supports their claim. The young birds are fully developed and able to fly before leaving the nest.

4. *Ptychoramphus aleuticus*. Cassin Auklet. Although several attempts were made to distinguish the burrows of the Cassin Auklet from those of the

Ancient Murrelet there is apparently no external mark of identification. The natives state that Cassin Auklet arrives on Forrester Island about March 1, and as it commences nesting earlier than the Ancient Murrelet it would be possible at that time to accurately locate and estimate the number of nests. In the latter part of May (the 20th) when their burrows were first found by us the eggs were in an advanced stage of incubation, and the murrelets had long since commenced the cleaning of their burrows. It was accordingly impossible to determine the exact numbers of the two species. It can be said, however, that the Cassin Auklet has been found to occupy several sites from the sea level to a height of five hundred feet, and the presence of egg shell fragments in many places indicates their general distribution over the island and in small numbers on Lawrie and South islands. As in the case of the Ancient Murrelet, the openings of the burrows are located about the roots of trees, or beneath partially buried logs or stones. The tunnel itself ranges from two to four feet in length, and is usually only sparingly branched. Whether they occupy the same home season after season is not known. It is certain, however, that several of the tunnels have been occupied at one time by mice, as is evidenced by accumulations of gnawed cones in some of the lateral galleries, or in the material scraped from the main canal and accumulated about the entrance.

On Forrester Island the duties of nest building are no more onerous than characterizes the species elsewhere. A few twigs of the Sitka spruce together with old or mouse eaten cones and occasional fragments of moss appear to be all that is necessary. The length of the incubation period was not determined, though Captain John (a remarkably keen and accurate naturalist of the Haidah tribe) says that it lasts "about two weeks". Fully three weeks more are required to bring the fledgling to the time of departure from the nest. During the time of incubation, the female occupied the burrow in five cases at least, and the Indians claim that she is fed during the night by the male and never leaves the nest until the young is several days old. The food of the young and of the adults as well, was found to consist of copepods and an undetermined species of shrimp or amphipod.

The Haidah name of the Cassin Auklet is "hatzah", referring to their nocturnal note. In ancient times this species figured largely in the native's bill of fare, and large numbers were annually taken by means of snares or were attracted by bonfires and subsequently knocked down. The fishermen reported on several occasions that in the early morning these birds had struck their tents, and in a stunned condition were readily taken. In conclusion it may be said that while the species is widely distributed throughout the island there is no reason to believe that they are numerous. They are met with occasionally out at sea, but their numbers are relatively few.

5. *Synthliboramphus antiquus*. Ancient Murrelet. Of the three nocturnal burrow-inhabiting birds nesting on the main island the Ancient Murrelet appears to be the most abundant. In many places the hillsides are riddled with their galleries from the shore line to a height of from four to five hundred feet. Their range is therefore identical with that of the Cassin Auklet, but after fairly extensive observations it is safe to say that the murrelet outnumbers the auklet by at least twenty to one. On our arrival (May 16) the burrows gave evidence of recent cleaning since loose masses of spruce cones, needles and earth formed a fresh looking mound in front of the entrance. As

in the case of the Cassin Auklet, the burrows appear to have served originally as the homes of mice, or at all events to have housed them during the winter; for small heaps of gnawed cones were frequently found in some of the lateral branches of the tunnel.

The opening of the burrow is situated among the roots of the spruce and under logs or more rarely beneath stones or in crevices among the rocks. The tunnel pursues an irregular course from the entrance for a distance ranging from eighteen inches to four feet, with from one to three short, lateral chambers leading off from the main trunk in the case of the larger burrows. This season the period of egg-laying probably commenced early in May, though the greater number presumably lay about the 20th. At all events newly hatched chicks were seen as early as May 29, and were very abundant during the second week in June. After this date the numbers rapidly diminished, though young birds were seen as late as July 1. It is claimed that the duties of incubation are performed by the female, and an examination of four individuals dug out of the nest showed this to be the case. The diurnal absentees put in an appearance shortly after nightfall, or more accurately from about 11 P. M. until midnight. An outgoing stream commences during the latter part of this period and continues until about 2 A. M. Very few return after 3 A. M.

The journey of the young to the sea is one of the most interesting sights on the island, and by the aid of a lantern was witnessed on several occasions. The pilgrimage is made during the night within a day or two after hatching, and is evidently initiated by one or both of the parents who take up a position on the sea not far from the shore. Here, about midnight, they commence a chorus of calls resembling the chirp of an English sparrow with the tremulo stop open, and in response the young, beautiful, black and white creatures as active as young quails, soon pour in a living flood down the hillsides. Falling over roots, scrambling through the brush or sprawling headlong over the rocks, they race at a surprising rate of speed drawn by the all-compelling instinct to reach the sea. They may be temporarily attracted by the lantern's light, and flutter aimlessly about one's feet; but sooner or later they heed the calls and once more plunge down the slopes. Almost every night during these migrations the surf was pounding violently on the rocky beaches, and many times one could see the young swept off the cliffs, and after struggling a moment in the waves they disappeared from sight and seemed doomed to destruction. Notes made at this time run as follows: "The tremendous violence of the breakers, churned to foam on the low yet precipitous cliffs, have destroyed birds of larger size and smashed boats to splinters. It is therefore altogether probable that the life of many of these delicate and diminutive birds is snuffed out during each migration."

To test the correctness of this observation a young murrelet, which came down the slopes early one evening, was liberated on the beach close to the dashing surf. Without a moment's hesitation, and without the stimulus of a parent's call it plunged boldly into the water, poised a moment on the summit of a great foam-crested wave, and dived with surprising speed and accuracy to reappear ten seconds later as many feet at sea. A momentary appearance, another dive and still another carried it beyond the swirl of the surf, and, swimming rapidly and paddling across patches of kelp always in a bee line, it soon disappeared from view. It is evident therefore that the last sentence of the preceding paragraph is in need of revision.

A trip to sea during the daytime in the first half of June will serve to show many young birds in company with one or both parents, and there is thus no doubt regarding the ability of the parents to recognize their offspring though the night be dark and tempestuous. On several occasions fishermen reported finding the young too weary to avoid their boats during stress of weather, and it is altogether possible that many are gradually worn out and drowned, but although this season was unusually stormy many young birds were seen during July that had weathered all the gales and were abundantly able to care for themselves.

6. *Larus glaucescens*. Glaucous-winged Gull. While gulls are abundant on and about Forrester Island they are all representatives of a single species, the glaucous-winged. Several natives are responsible for the statement that during the late fall the great majority of this company leave for the larger islands skirting the coast, where they find on the clam and mussel beds a larger food supply than is present on Forrester. Be this as it may, it is certain that at the time of our arrival (May 16) they were present in large numbers, and there was no material increase throughout the summer season. The adults early congregated on the rocky islets and precipitous cliffs which later in the season formed their nesting sites, and from such bases of operations they made frequent sallies into the herring schools. Associated with them were numerous immature individuals, but the great majority of this last named class flocked by themselves and occupied roosting places from one end of the island to the other. A favorite feeding ground was the little bight immediately in front of the camp, where they gathered daily and filled themselves to the point of repletion on the herring and remains of salmon thrown out on the beach.

The first signs of nest building were noticed on the 25th of May, and by the 29th all were gathering grass and weeds. On June 2nd several nests contained one egg, and a very considerable number of birds had commenced the work of incubation by the 10th. In the latter part of the month several nests were found with young, of which the majority were gone by the 1st of August.

For some unknown reason a surprisingly small number of gulls nested on Forrester Island although large flocks were visible at all times. The hand trollers made the claim that the noise and odor of the gasboats were responsible for their departure from the normal, but the fact that they showed little fear of man or of his boats in the harbor militates against such a theory. The eagles and probably the crows destroyed some fledglings, as they doubtless have done for countless generations, but this scarcely appears to amount to a sufficient cause. It is possible that some of the fishermen felt the need of relief from the usual diet of beans and bacon and helped themselves to eggs though no such offense was actually noted.

In this connection it may be added that guarding Forrester Island against the activity of poachers is impossible with any guard of less than a dozen men. Considering the fact that the fishermen leave for the fishing grounds as early as three in the morning and return as late as nine in the evening, and during this period are scattered from one end of the island to the other, it is obvious that where the determination is strong nest robbing is comparatively easy. However it is not so readily possible to ship away the great quantity of eggs which were annually collected in former times, though at least one small shipment was made this past year as was evidenced by a stream of yolk

gently oozing from a case reposing on the deck of one of the outgoing fish buyer's boats.

7. **Cephus columba.** Pigeon Guillemot. The Pigeon Guillemot was represented on Forrester and the adjacent islands by approximately five hundred individuals. Almost every headland was the home of a small colony, and yet their nests were surprisingly rare. A small community a short distance south of the camp was kept under observation, and judging from its experience it is probable that they suffer greatly from the depredations of the fish crow. Out of six pairs only one succeeded in hatching a brood, and cracked or punctured shells indicated the culprit. Fish crows were seen on several occasions skulking about the cliffs after several cormorants had been disturbed and left their nests, and in one instance an egg was carried off and dropped though not eaten. The natives report that the fish crow destroys the eggs of



Fig. 16. NORTH SHORE OF FORRESTER ISLAND; NESTING PLACE OF THE GLACOUS-WINGED GULL AND PELAGIC CORMORANT

every species of bird whose nests are exposed, and they declare it to be fully as great a pest as the eagle.

The first eggs were seen during the third week in June, and the period of incubation appears to last about three weeks.

8. **Uria troille californica.** California Murre. It was the general belief of the fishermen that the murre outnumbers every other species of bird on Forrester Island. This opinion appears to rest largely upon the fact that where they roost on the cliffs or float on the sea they form dense flocks often of great size. Nevertheless their nesting places are confined to a few sharply defined areas, and a careful estimate renders it probable they do not exceed fifty thousand individuals. The full population was in evidence by the last of May, though the nesting season did not commence until the latter part of July. Their food consisted almost wholly of sand launces, varied by an occasional shrimp or amphipod.

9. *Oceanodroma leucorhoa*. Leach Petrel. Leach's Petrel is said by the natives to nest only on South Island, and this appears to be the case as no evidence of their dwelling places was detected during numerous excursions over Forrester and Lawrie islands. On the southern island, however, their name is legion. Almost as soon as a landing was made small openings were noticed in the moss covering the rocks, and while these appeared surprisingly similar to those made by mice a minute's work was all that was necessary to disclose their true character. Others were half hidden in the grass and among the underbrush, and from the central valley to the summits of both hills the soil was riddled with holes. In various places from four to seven were counted in a space a yard square, and one must tread cautiously indeed to escape breaking through the burrows at every step. At the time of the first landing, June 30, the birds living in the comparatively dry soil covering the rocks had completed the clearing of the burrows and the building of the nests, and in most

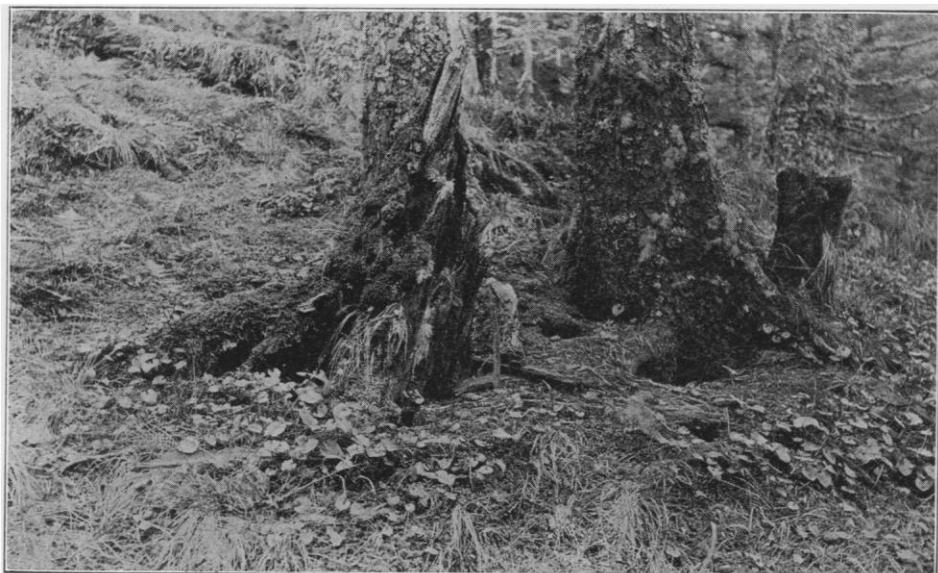


Fig. 17. BURROWS OF THE LEACH PETREL ON FORRESTER ISLAND

instances had deposited the single egg characteristic of the genus. In the underbrush the burrows had been cleared, the refuse material had been dragged to the front of the entrance, and the nests had been completed in many instances. However the breeding season is not sharply defined since a few fresh eggs were found on July 19 and 20.

The burrow leads inward from the entrance for varying distances, two feet being about the average length. In extreme cases tunnels have been opened having a length of fully six feet, and from two to five birds occupy this in common, each nest being placed in one of the lateral offshoots from the main trunk. Such extensive residences have evidently been vacated by Cassin Auklets as one young bird of this species was found in a burrow with five petrels. The nest is a flat, thin pad composed of fragments of grass, bits of moss and small twigs of spruce or salmon berry. As is well known the egg is

white in color with a faint ring of red spots about the larger end, though this last named character is not invariable.

The exact period of incubation was not determined, though it is apparently about two weeks. As previously mentioned the first eggs were laid about June 30, and chicks fully five days old were found on the 19th of July. The duty of incubation rests on either parent as both males and females were found during the day. The prevalence of storms and rough weather made it necessary to confine our observations to the day-light hours so that no first-hand information can be given regarding the return of the absent mate and the feeding of the young, but the natives are agreed that the birds change places on the nest after nightfall, and after an interval of about four hours the day's shift takes place. The flight of the parent birds upon leaving home is always to the westward. In other words they do not occur in the neighborhood of the mainland or the islands along the coast, but hunt their food on the high seas far from any body of land.

An examination of the stomach contents of three individuals showed that they had been feeding upon some species of crustacean, apparently a shrimp, though this food product had been reduced to a pulp and so greatly digested that a few particles of chitin were alone recognizable. The resulting semi-fluid, highly oily substance, having the characteristic musky odor of the bird and burrow, is vomited out when the bird is disturbed, apparently for purposes of defense.

It is difficult to estimate the number of these birds nesting on South Island. The Indians sometimes call the place "the basket" since it is so full of holes, but when asked regarding the number of holes or birds their guesses ranged from ten thousand to two hundred and fifty thousand. In a rough way the island was measured into a number of plots and in each of these the number of nests was estimated. The result totalled not far from seventy-five thousand, or one hundred and fifty thousand birds, and this is certainly a conservative estimate.

10. *Oceanodroma furcata*. Forked-tailed Petrel. The Fork-tailed Petrel is likewise confined to South Island, where it nests in small numbers when compared with the Leach Petrel. Following the directions of Captain John their nests were found on the summit of the heights adjacent to the central ravine, but owing to the fact that their burrows are in no manner different from those of the Leach Petrel, among which they are placed, and that fully twenty-five of these last named birds must be dug out in order to find one forked-tailed, no extended search was made for this species. Two dead individuals were picked up at the entrance of uncompleted burrows, but there is no practicable method whereby the limits of the colony can be accurately defined.

The density of the growth of spruce on the summit results in fairly clear ground, and great numbers of burrows occur in the soft soil in the open places or under logs or about the roots of trees. As indicated above there is no token whereby one can distinguish the homes of the forked-tailed (though one nest was located by one of the characteristic light colored feathers in front of the entrance) and it is accordingly impossible to accurately estimate the population of the colony. It is safe to conclude with the natives that the species is confined to high ground, and that not more than one burrow out of twenty-five

or thirty is the home of the forked-tailed, but beyond this point it is useless to speculate.

Not only is there no external mark whereby the burrow of the Forked-tailed Petrel may be distinguished, but the close resemblance between the home of this bird and that of Leach's extends to the burrow, the nest and even to the egg. The only certain method of distinguishing the eggs and young is to find them with the parent. Furthermore the native's observations regarding both species show them to have the same general habits. In the case of the forked-tailed one of the parents remains out on the open ocean during the day. It returns about nightfall to relieve its mate, and again sets out to sea in the early morning. According to the natives the food consists of "crabs", probably meaning shrimps.

11. *Haematopus bachmani*. Black Oystercatcher. Probably fifty pairs of oystercatchers nested on the shores of Forrester, Lawrie and South islands, during the season of 1913. The few nests actually discovered were situated

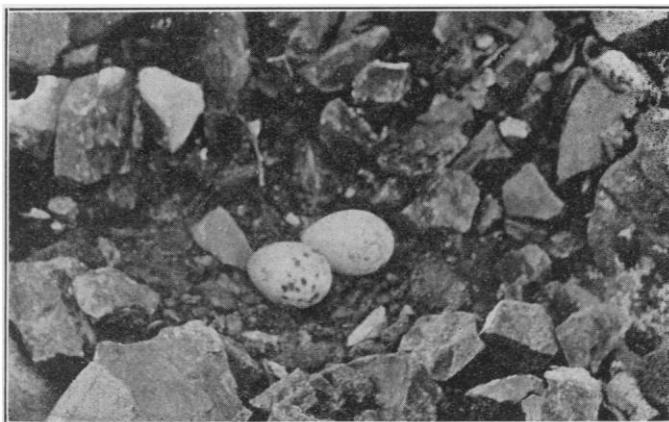


Fig. 18. NEST OF BLACK OYSTERCATCHER ON FORRESTER ISLAND, SOUTHEASTERN ALASKA

on rock masses a few feet above the high tide mark, and contained one or two eggs each. The building material in every instance consisted of small fragments of stones, ranging in amount from a couple of ounces to half a pound. The first eggs were noted on June 18, and young birds were seen on July 10.

The precocial fledglings very early accompanied their parents on short journeys about the cliffs, and within a week after hatching were observed pecking at limpets, although it is highly probable that for several days thereafter they depended on the old birds for the greater part of their food supply. During this time the young resemble diminutive ostriches with thick-set legs, big feet and fluffy plumage, which, it may be added, harmonizes to a high degree with the surroundings. Furthermore they have the same habit of hiding the head when it is not possible to conceal the entire body beneath a stone. From the stomach contents of adults, and judging by the shells scattered about the nests, the food of the black oystercatcher consists wholly of limpets.

12. **Phalacrocorax pelagicus pelagicus.** Pelagic Cormorant. This species is fairly common along the shores of Forrester Island and to a less extent occurs on both Lawrie and South islands. Nest building commenced during the first week in June and eggs were in evidence by the 26th. Young birds were in the nests twenty-four days later though it is possible that the period of incubation is somewhat shorter than this. Several times at sea these birds were seen feeding on herring.

Stanford University, California, October 23, 1914.

BIRDS OF THE BOSTON MOUNTAINS, ARKANSAS

By AUSTIN PAUL SMITH

THE FOLLOWING list consists of birds that were met with by the writer during an eighteen months residence in the region; or of species reported to him as occurring within the area hereafter specified.

The Boston Mountains comprise a range of rough hills covering the greater part of several counties in northwestern Arkansas and extending for a short distance into Oklahoma. Essentially a part of the Ozark plateau, this group constitutes the highest land within the state, with exception of a few isolated peaks of the Ouachita Mountains, that lie south of the Arkansas River. The Boston Mountains reach an altitude of 2200 feet, in the vicinity of Winslow, Arkansas.

At least ninety percent of the area of these hills is forested; but much of it is second growth timber. Such as remains of the primitive forest is largely confined to ravines and rough hillsides; but, wherever found, it contains most of the species of deciduous arborescent growth, general to the Carolinian zone within the Mississippi watershed. On areas that have been "cut-over", and allowed to revert to forest, the principal trees are oaks of several species, including *Quercus velutina*, *alba*, *rubra*, and *coccinea*; hickory, mostly *H. glabra*; chinquapin (*Castanea pumila*); sour gum (*Nyssa sylvatica*); and persimmon (*Diospyros virginica*). Wherever clearings have been made and abandoned, a vigorous growth of sassafras now exists. Sweet gum (*Liquidamber styraciflua*), sycamore (*Platanus occidentalis*), and elm (*Ulmus americana*) are usually found in the immediate vicinity of streams. The undergrowth of the larger ravines is largely, often entirely, composed of Indian currant (*Symporicarpos vulgaris*).

The geographical area of this article is confined to a radius of ten miles of Winslow, and within the limits of Washington county, unless otherwise stated; also at an altitude of 1800 feet, or over.

I have found A. H. Howell's *Birds of Arkansas* (Biological Survey, Bulletin no. 38) of great assistance in preparing this list, it being the only publication that has yet appeared relative to the avifauna of that state. Acknowledgment is also due the Bureau of Biological Survey for the identification of several of the forms included herewith.

Anas platyrhynchos. Mallard. A flock of eight birds, closely bunched, and not more than fifty feet overhead, passed November 23, 1913. In 1914, three birds were noted as early as September 1.